THE ANNALS

AND

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[THIRD SERIES.]

" ..... per litora spargite muscum,
Naiades, et circùm vitreos considite fontes :
Pollice virgineo teneros hic carpite flores :
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas ;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
N. Parthenii Giannettasii Ecl. 1.

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I.—*On the Classification of the Annelides.*

By A. de Quatrefages*.

All naturalists know what Linnæus and his immediate successors understood by the word *Vermes*; they also know that Cuvier was the first to disentangle the chaos in which the want of precise knowledge had long left this mass of Invertebrata, and that in consequence of the division of the animal kingdom into four sections (*embranchements*), the expression *Vermes* ceased for a long time to be applied to any group of the animals of which it had formerly been the common designation. Without enumerating here the numerous endeavours made for the purpose of perfectionating the first conceptions of the great reformer of zoology, I shall merely remind the reader that M. Milne-Edwards proposed to divide the Articulata of Cuvier into two subsections; that one of these divisions has received the name of *Vermes*, which appeared to be finally struck out of our scientific catalogues; and that this view has been accepted by a great number of naturalists. For my part, I believe it to be fully justified.

The *subsection Vermes* being thus established, it remains to

* Translated by W. S. Dallas, F.L.S., from the 'Annales des Sciences Naturelles,' 1865, Zoologie, p. 253. This memoir includes a reply to some remarks by M. Claparède on M. Quatrefages' system; of the latter a translation will appear in a future Number.

divide it into subordinate groups. Many attempts have been made in this direction: I myself, as early as 1849, proposed a distribution which, dividing the *Vermes* into two series composed of corresponding terms, allows us to appreciate and distinguish the *relations of analogy* and the *relations of affinity**. This mode of conception of this embarrassing group, which everything seems to me to justify more and more, led me from that period to separate from the *class of Annelida* two great groups which had been united therewith by Cuvier, Lamarck, and their successors, namely the *Lumbricina* and the *Hirudinea*, which to me constitute two distinct *classes*, that of the *Erythræma* and that of *Bdellea*.

Thus reduced, the class of Annelida, as I understand it, no longer contains either the armed Gephyrea, which have been placed among the Chætopod Annelides by several naturalists, or the Leeches and Lumbricina. It is composed entirely of the *Annélides dorsibranches* and *Annélides tubicoles* of Cuvier (*A. néréidées* and *A. serpulées* of Savigny; *A. errantes* and *A. tubicoles* of Audouin and Milne-Edwards, and of most authors; *Rapacia*, *Limivora*, and *Gymnocopa* of Grube).

As by most of my predecessors, the totality of species here to be arranged is divided by me into two *orders*; but the considerations which have led me to this result differ from those which have generally been followed. Hence result considerable differences in the formation of the orders themselves and of the *sub-orders*, and in the number and arrangement of the *families*.

The latter first occupied my attention. In my eyes they constitute the fundamental element of every systematic classification. Essentially they are only the Linnæan genera better understood and better defined. The species once distributed into really natural families, their grouping in divisions of a higher order becomes at once easier and more certain, and in any case we must pretty nearly get correct and distinct notions upon the totality of the *class*.

It is because I am deeply convinced of the truth of the preceding statements that I set myself especially, and in the first place, to limit my families strictly, not placing in them any but

*I here reproduce the table which I published in the 'Institut' (No. 816):—

Dicœcious worms.	Monœcious worms.
Annélides.	*Erythrèmes.*
Rotateurs.	
Géphyriens.	
Malacobdelles.	*Bdelles.*
Myocalés.	*Turbellariés.*
Nématoïdes.	
	Cestoïdes.

those genera whose relationship was indisputable, and their affinities easily grasped. Now the class of Annelides, in consequence of its very great variability of type, presents a great number of genera which, although composed of very well-known species, do not present this double character. In such cases I have not hesitated to isolate them—to place them, so to speak, outside the series—depending on the investigations of my successors to assign them sooner or later a definitive place. Systematic minds, those who always require absolute conclusions, will probably blame me for having acted thus; but those naturalists who prefer certainty to rapidity of progress will, I hope, approve my course. I have also, of course, placed among the *incertæ sedis* those species and genera upon which we are in want of sufficient data; but I have endeavoured to determine at least the family to which they should be referred, and I believe I have succeeded in the great majority of cases.

Another consequence of the precision which I have endeavoured to introduce in the establishment of the families has been that I have been led to increase their number more than had been done by any of my predecessors. Savigny only reckoned seven, which is due to the small number of species known in his day. Johnston increased this number to fifteen, Grube to nineteen, and Schmarda to twenty-one. Although I place Grube's entire family *Amitidea* among the *incertæ sedis*, I have thought it necessary to divide the class into twenty-six families.

This multiplication of fundamental groups will not, however, at all surprise those who take account of the progress made since the publication of the 'Système des Annélides' (1820). Savigny only admitted twenty-six genera. Milne-Edwards, in the second edition of Lamarck's work (1830), admitted forty-nine. At the time of the publication of his 'Familien der Anneliden' (1851) Grube classified eighty-six genera. In 1861 Schmarda, in his 'Neue wirbellose Thiere,' admits ninety-seven. Now, by adding to the labours of my predecessors the results of my own investigations, either on the sea-shore or in the magnificent collections of the museum, I have arrived at the number of 245 genera, of which 181 have been able to be placed in a systematic series, and 64 still remain *incertæ sedis* for reasons which I have just indicated.

I do not, however, think that I have allowed myself to be betrayed into an exaggerated multiplication of these elementary groups. The number of constituent species has never appeared to me to be a real reason for effecting a breaking up which would not have reposed upon a totality of precise characters. This exigency has even led me to reject several genera established

by my predecessors. In every case where, in a collection of species, the differences have appeared to me to depend solely upon the more or less marked development of one or several characters, I have united them in a single generic group, confining myself to the establishment in the latter of *tribes* and *sections* fitted to facilitate investigation. Thus the genus *Polynoë*, for example, containing seventy-seven species, has been divided into two tribes and ten sections.

In return, whenever I have noticed very distinct characters, I have not hesitated to establish a genus, even should it contain only a single species. This circumstance has occurred several times in the family of the *Syllidea*. Here the confusion of the two parts of the head, and the consequent non-distinction of the antennæ and tentacles, had often caused the union of species which, when once the nature of these parts and organs was recognized, evidently required to be separated.

The families once determined, it remained to group them in *orders* and *suborders*. This distribution, attempted at different times, had led my predecessors to results which sometimes differed considerably. Without dwelling upon purely historical details, I shall confine myself here to the indication of the course followed by me.

If there be a group in which the employment of ALL the characters is not only useful but necessary in the appreciation of zoological relations, it is most certainly the group of Annelides, and this in consequence of the extreme variability by which it is distinguished. But the more we attempt to grasp the characters, the more indispensable does it become to arrange them in the order of their importance. Now to judge of this importance the naturalist must choose between two modes of action which are very different, although often confounded—that of Cuvier and that of Jussieu.

The former places himself at the physiological point of view. He seeks the dominating characters in the organs charged with the function which appears to him to be of the highest value. This mode of appreciation presupposes that each function is performed by means of a special organ. Now at the present day we know that this is by no means the case in a great number of Invertebrata. The method of Cuvier therefore reposes on an *à priori* which is true for the Vertebrata and for some groups of Invertebrata, but incorrect for the rest. The Annelides present frequent examples of this inexactitude, and, indeed, precisely in the order of the anatomical arrangements belonging to one of the most important functions, to one of those which Cuvier placed in the foremost rank—that of respiration. It is scarcely necessary to refer to the fact that, in this

class, certain groups have well-developed branchiæ, whilst other groups, sometimes very nearly allied to the former, do not present the least trace of special respiratory organs. Cuvier's principle, and the rules which he deduced from it, are therefore inapplicable to this class.

Jussieu kept strictly to observation. With him the most essential character is that which persists in the largest number of species and groups. This rational and wise manner of appreciating the value of characters is that which I have thought it necessary to adopt.

It has led me to recognize that one of the fundamental principles taught by Blainville had in this case a very decided value, and that it was in the modifications of the external form that we should seek for the bases of the distribution of the families.

Thus the Annelides are essentially diœcious animals, composed of segments which repeat themselves, and bear on each side a perfectly characteristic organ—a foot armed with exsertile and retractile setæ.

It was natural enough to think that the modifications bearing on this general type must have a great value in relation to the present matter. In particular, every exception to the law of repetition appeared necessarily to take a place in the first rank, and to be the more important in proportion as it reached a greater number of secondary groups.

In fact, when we examine the Annelides from this point of view, we find that they divide at once into two groups. In one of these the same parts are repeated from one extremity of the body to the other. Hence the animals present no distinct regions. This group constitutes our first order, that of the Annelidæ erraticæ. It is composed almost entirely of species belonging to the *Dorsibranches* of Cuvier, the *Errantes* of MM. Audouin and Milne-Edwards, and the *Rapacia* of Grube; I have only added to them the *Chloræmea* and the *Polyophthalmea*.

In the second group the law of repetition of parts is suddenly interrupted in particular places, and the body is thus composed of distinct regions, in each of which the segments resemble each other, whilst they differ from one region to the other. This constitutes is for me the order of the A. sedentariæ. It includes all the *Tubicoles* of Cuvier and of Audouin and Milne-Edwards—that is to say, the *Serpulées* of Savigny, the *Limivora* of Grube. I also place with them a certain number of the *Errantes* of the former, some *Rapacia* of the latter of these naturalists, and the *Tomopterides* (*Gymnocopa*, Gr.).

Each of these two orders is divided into two suborders by

means of considerations of the same nature, and derived likewise from exceptions presented to the law of repetition.

Thus in the first order (*A. erraticæ*) the greatest number of the species are entirely composed of similar segments; in other words, the repetition is manifested from segment to segment. In some others the repetition only takes place from pair to pair of segments, at least on the greater part of the body. The former constitute for me the *suborder* of *Erraticæ propriæ*; the latter that of the *Erraticæ aberrantes*.

In the same way, among the Sedentariæ, a very small group, including only the *Chætopterea*, shows us the law of repetition failing in the segments of a single region; it constitutes for me the suborder of *Sedentariæ aberrantes*. In the second suborder of this division the law of repetition is observed in the different regions of the body; it includes the *S. propriæ*.

As a matter of course, in the establishment of the families, I have taken into account anatomical and physiological as well as external characters. But in the table which I have the honour to place before the reader, I have had recourse solely to the latter, in order to facilitate the zoological study of the species. The armature of the mouth, the absence or presence of branchiæ, the position and form of the latter, the absence or the presence of certain appendages of the head or of the feet, the modifications of these latter, &c., have been employed successively in the order just indicated. This order itself was the consequence of the principle of the relative constancy of the characters. It has enabled me to characterize each family with precision, and to group them in such a manner as to bring into relief a certain number of general results, well fitted, it appears to me, to justify the method followed.

Thus, on glancing at the accompanying table, every naturalist will perceive that the divisions resulting from considerations derived solely from external characters are equally homogeneous from an anatomical point of view. He will also perceive that the totality of the families in the two orders subdivides into secondary groups corresponding to so many more or less important subtypes, of which the representatives are united; and, lastly, that the exceptional or *aberrant* types are also quite naturally brought to the notice of the reader. I may be permitted to dwell a little upon these considerations.

Leaving out of consideration for the present the Suborders I. and III., including the general aberrant types of the two great fundamental divisions, there remain, as composing the *Erraticæ propriæ*, thirteen families, and ten for the *Sedentariæ propriæ*. Let us first notice the former.

The presence of cephalic rotatory apparatus serving for loco-

motion, in the first place sets completely on one side the very exceptional type of the *Polyophthalmea*. The remaining twelve families represent the type of the *A. erraticæ* in all essential points.

These twelve families are themselves divided into two groups, remarkably distinct in many respects, although the table only indicates one difference, that presented by the armature of the mouth. The *Eunicea* and *Lumbrinerea* on the one hand, and on the other the ten other families, present, from an anatomical point of view, such marked contrasts, that it will probably some day be necessary to represent them in the classification itself, by forming a separate suborder with the two families just mentioned. Thus, to cite only a very striking fact, I will mention that, according to investigations of my own already of an old date, the stomatogastric nervous system originates upon the cerebrum itself in the *Eunicea* and *Lumbrinerea*, whilst it issues from the connective in the *Nereïdea*, the *Nephthydea*, the *Phyllodocea*, the *Glycerea*, &c. The digestive apparatus presents equally remarkable differences, extending not only to the armature, but even to the organization of the trunk.

The ten families with the buccal armature simple, or none, also divide into some well-marked secondary groups. Of these, the *Glycerea* alone form one. In them the head seems to attempt a repetition of the body on a small scale, and in the opposite direction. It is composed of more or less numerous segments, and thus departs completely from the ordinary type. It may be remarked that this morphological modification likewise coincides with very interesting anatomical peculiarities, among which I shall limit myself to citing the presence of distinct globules in the blood, the existence of branchiæ of an exceptional structure, the almost complete absence of inter-annular diaphragms, &c.

The *Glycerea* set on one side, we find two groups very distinctly characterized by the presence and absence of branchiæ. A perfectly similar fact had already presented itself in the group of Erraticæ with the buccal armature complicated. But, in the the latter, the disappearance of the branchiæ may be regarded as a simple fact of organic simplification coincident with others bearing especially upon the vascular apparatus. The type, moreover, remains the same in the arrangement of the nervous system and digestive apparatus. In point of fact, the *Lumbrinerea* are *degraded Eunicea*. It is otherwise with the Erraticæ with a simple buccal armature. We cannot, for example, regard the type of the *Nereïdea* as derived by degradation from the type *Nephthys*; for the former, in all respects equal to the latter, is superior to it in some particulars (such as the

development of the trunk and of the stomatogastric nervous apparatus). Still less can we refer the *Nereïdea* to the *Nerinea* or the *Cirratulea* by considerations of the same nature. We are even led to see that, whilst in the Erraticæ with a complicated buccal armature the superiority belongs incontestably to the branchiate family, in those with a simple buccal armature the superiority reverts, on the contrary, to one at least of the abranchiate families (*Nereïdea*). Nevertheless, in both divisions, the branchiate and abranchiate species very evidently occupy the position of mutually *corresponding terms*, if we place ourselves at the systematic point of view of respiration.

From what has just been said, it follows that the Erraticæ with a complicated buccal armature form a remarkably natural division, inasmuch as the type, remaining the same, presents itself to the naturalist sometimes as being realized very completely, sometimes as degraded. The two families resulting from these different conditions are, moreover, very homogeneous. In the first, that of the *Eunicea*, which possesses branchiæ, these vary as regards their form and complication, without its being possible, however, to separate the genera from each other. The same intimate relations exist between the genera belonging to the abranchiate family (*Lumbrinerea*).

Nothing of this kind occurs among the Erraticæ with a simple buccal armature. Here, in the branchiate species, the least variation in the respiratory organ coincides with other modifications of sufficient importance for the multiplication and distinct separation of the families, and these modifications affect even the most central organs, the nervous system. The composition of the cerebrum and the mode of distribution of the nervous trunks are quite exceptional in the *Nephthydes*, which, in other respects, would closely approach the *Nereïdea* and the *Phyllodocea*; the *Nerinea* have the abdominal chain double, and in this respect resemble the best-characterized Sedentariæ (*Serpulæ* and *Sabellæ*); the *Cirratuli*, on the contrary, present abdominal ganglia which appear as if fused into a ribbon, which, again, reminds us of what exists in other Sedentariæ (*Clymene*). All these facts, and many others, indicate the existence of several distinct secondary types in this totality of branchiate Erraticæ with the buccal armature simple.

We find rather more heterogeneity in the species of the same division which are destitute of branchiæ. Here the *Nereïdea* may be regarded to a certain extent as the highest expression of a type to which belong the *Syllidea*, the *Hesionea*, and the *Phyllodocea*. Nevertheless the resemblance is not strongly marked, either internally or externally.

The *Syllidea*, a great number of which would perhaps depart

less widely from the family with which they have been so long united, are, however, well distinguished by a striking degradation both internal and external. Moreover, in proportion as we are acquainted with it, this family of *Syllidea* acquires more and more the physiognomy of a little world apart, in which organic variability is displayed within still more extended limits than in the rest of the class, and which of itself presents examples of some of the most interesting physiological phenomena. I refer to the facts of generagenesis which have hitherto only been observed in this family and in some small species of Sedentariæ of which we cannot make a distinct family.

To sum up, of the fifteen families which compose the order Erraticæ, seven possess branchiæ, and eight are destitute of those organs. The advantage in favour of the latter increases considerably when we descend to the details of species and genera. To the abranchiate types belong all those genera which are distinguished by the number of their species (such as *Polynoë*, seventy-seven species, *Nereïs*, eighty-one species). If we examine the order Sedentariæ from this point of view, we find that it is in quite a different case. Here, of eleven families, three only are deprived of branchial organs; eight possess well-marked branchiæ. Moreover, of the three abranchiate families (*Chætopterea, Tomopteridea, Clymenea*), there are two which together only include three genera with very few species; whilst among the branchiate families we find the richest in genera and species (*Terebellea* and *Serpulea**). From this comparison we may conclude that among the Erratic Annelides the type tends up to a certain point to be realized without special respiratory organs; whilst among the Sedentary Annelides the opposite tendency is most distinctly manifested.

In both orders we meet with species bearing branchiæ on the head, and others bearing them on the body. But in the Erraticæ the former form only a single family, composed of a small number of genera and species (*Chloræmea*†); in the Sedentariæ, on the contrary, the family which presents this peculiarity is much richer in genera and species (*Serpulea*). Moreover the *Chloræmea*, by the totality of their organization, and especially by the entirely exceptional arrangement of their digestive apparatus, constitute a truly *aberrant group* in the midst of the other families of the order. On the contrary, the Sedentariæ with cephalic branchiæ probably present the most complete realization of the type of the order to which they belong.

If we were better acquainted with the organization of the Sedentariæ with abdominal somatic branchiæ, we might probably be

* The *Sabellæ* and allied genera belong, in my opinion, to this family.

† With me the buccal ring forms part of the head.

able to show that the converse is equally true. But here the most important type, that of the *Ariciea*, is wanting, and our data are sufficient only as regards the *Arenicolea*. Now, to judge from this example, we may say that the species which present this peculiarity depart in certain respects from the general type of the class, and are sufficiently removed from the type of the order to have led to their having been often removed from it.

Savigny placed the *Ariciæ* among his Néréidés (*Erraticæ*). He has been imitated by Cuvier, Blainville, Audouin and Edwards, Grube, &c. Most of these authors have referred the *Arenicolæ* and the *Opheliæ* to the same type. On the other hand, the *Siphostomata*, the *Pherusæ*, &c., species of the family *Chloræmea*, have generally been placed by the side of species which enter into our order of Sedentariæ as established here.

Whilst acting otherwise than my predecessors, I can easily understand how they were led to the conclusions which I dispute. It is impossible to deny the resemblances which ally the *Chloræmea* to the best-characterized Sedentariæ. On the other hand, the *Arenicolæ*, the *Opheliæ*, and especially the *Ariciæ*, have certainly something which approximates them to the Erraticæ. But these relations in both cases are due to *analogies*, and not to *affinities*. The *Chloræmea* are *the representatives of the type of the Sedentariæ* in the midst of the true Erraticæ. The *Opheliea*, the *Arenicolæ*, and the *Ariciæ* in the same way are *the representatives of the Erraticæ* among the Sedentariæ. There is, so to speak, *reciprocity* between the two orders—each of them having in the other some species which recall it to mind. These species, up to a certain point, are *reciprocal terms* of one another.

The preceding examples perhaps will not suffice to lead all naturalists to admit the fact, here of fundamental importance, of this *reciprocity of representation*, and the consequences which flow from it for the appreciation of true *relations of affinity*. The following is another and a more conclusive one, because it bears in both orders upon families as well marked as possible, because the inverse modifications bearing upon the same organs are at once very simple and very striking, and because, whilst influencing one of the most essential characters of the order, they do not authorize the formation even of new families, but only of *tribes*.

The family of *Nereïdea* as circumscribed by me is certainly one of the most natural and best defined. Essentially it includes only the genera *Lycastis* and *Nereïs* of the old writers. Œrsted in describing the *Heteronereïdes*, and Blainville in founding the genus *Nereïlepas*, effected mere dismemberments relatively to Savigny. But from the point of view which has served me for

the division of the Annelides in general, it will be seen that these two genera form, in reality, a small and very remarkable separate group. In fact, the law of repetition so generally applied in the Erraticæ, and so manifest in the *Nereïdes* proper, here undergoes a striking exception. In the *Heteronereïdes* especially, the foot, that fundamental organ, changes its form rapidly posteriorly in such a manner that the body presents two perfectly well-marked regions. Here, then, the essential character of the Sedentariæ makes its appearance. Is it possible from this fact alone to transport the *Heteronereïdes* to that order? Or should we even isolate them from the *Nereïdes*? A more careful examination shows that both these conclusions would be equally unjustified.

Thus anteriorly the *Heteronereïdes* are in all respects true *Nereïdes*, both externally and internally. The feet in particular are exactly the ordinary feet of the *Nereïdes*, to their very least details; and these feet are essentially arranged for walking. Posteriorly the body itself presents no change; it remains the body of a *Nereïs*. The feet alone are modified so as to become powerful organs of natation. But while becoming adapted to this new function, they still retain their original type. We find in them all the elements of the anterior feet, occupying the same position under slightly different forms, and complicated only by a small number of accessory parts.

The differences between the anterior and posterior regions are therefore more apparent than real; but the division of the body into two distinct parts exists none the less. There is here evidently as it were a reflexion of the type of the Sedentariæ making its appearance in the midst of one of the families most clearly belonging to the Erraticæ.

The *Terebellea* and the *Serpulea* present us with the exact *réciproque* of the preceding fact. In both we find a certain number of species which, as regards the two anterior regions (the head and thorax), completely realize the type of their family, but in which the posterior region of the abdomen no longer presents in its rami and setæ those changes which characterize it in the normal Sedentariæ, in the *Serpulea* proper. In these exceptional species the abdominal feet remain similar to those of the thorax, so that from one extremity of the body to the other we find no more distinct regions than in the Erraticæ. Nevertheless, in all other respects these species remain faithful to their types.

Thus these abnormal Sedentariæ are true *Terebellea*, or true *Serpulea* in their anterior portion, as the *Heteronereïdes* are true *Nereïdea* in the same part of the body. In the posterior region the *Heteroterebellea* and *Heteroserpulea* approach the Erraticæ, as the *Heteronereïdes* approach the Sedentariæ in the same region.

In the latter the resemblance is produced by the *appearance of an exceptionally distinct region*; in the former by the *disappearance of a normally distinct region*. In all it is in the fact that the unusual characters are manifested. Lastly, however striking these characters may be, they are the result of modifications which are really very simple, and which in no respect alter the special type of the organs affected.

It seems to me impossible to imagine a more complete fact of reciprocity, or one better fitted to illustrate the nature of the relations resulting from modifications of this kind. It is evident that we cannot place the *Heteronereïdes* among the Sedentariæ, any more than we can arrange a *Heteroterebelea* among the Erraticæ. We cannot even isolate the former from the family of the *Nereïdea*, or the second from that of the *Terebellea*, without the rupture of the most evident *affinities*. But these affinities are here complicated by *relations of analogy*. In the case before us the latter are much less marked than the affinities, and no one will hesitate as to the place belonging to the species under consideration. On the other hand, the *analogies* become stronger, and the *affinities* less marked in the *Arenicolæ*, *Ariciæ*, and *Opheliæ*; and this has has led to the confounding of these two sorts of relations, and to the placing of these three last genera among the Erraticæ, whilst the *Siphostomata* (*Chloræmea*) were removed to the Sedentariæ.

The reader will now understand, I hope, what I mean by the words *reciprocal terms*, and the nature of the relations which these terms present either with the group to which they sometimes seem to belong, or with that to which they belong in reality. I believe that the investigation of facts of the same kind must, in certain cases, be of considerable importance, and that such will be discovered elsewhere than among the Annelides —for example, among the Acephalous Mollusca.

It is not uninteresting to inquire which of the two orders into which the Annelides are divided makes the most efforts, so to speak, to establish these *relations of reciprocity*. The share is, in fact, very unequal: among the Erraticæ a single family betrays in its entirety certain characters which place it in the category of groups of which we are now speaking (*Chloræmea*). Among the Sedentariæ we find three (*Arenicolea, Ariciea,* and *Serpulea*), and perhaps a fourth (*Leucodorea*). In the first order a single family must be divided into tribes, in consequence of modifications which this type undergoes in the direction now under consideration (*Nereïdea*). We find two of these in the second (*Terebellea, Serpulea*); moreover, in both of them the number of heteromorphous genera is much greater than in the *Nereïdea*.

It will be seen, I hope, from what precedes, that the *reciprocal terms* are very distinct from *corresponding terms*, although the existence of the latter depends equally upon considerations derived from *analogy*, and not from *affinity*. There is *correspondence* when, in two great groups more or less remote, we find *similar* and not *inverse* modifications being produced. For example, the branchiate and abranchiate Sedentariæ are in a general way and in certain respects the *corresponding terms* of the branchiate and abranchiate Erraticæ. Nevertheless in this case the organic and morphological differences are sometimes great enough at least to dissemble these analogies. And yet, on close examination, it is difficult not to be struck by the fact that in both orders the respiratory organs present extremely similar modifications. Thus, at the first glance, the cephalic branchiæ of the *Chloræmea* resemble those of certain low Sedentariæ*; the arborescent somatic branchiæ of certain *Amphinomea* evidently correspond with the branchiæ situated in the same region of the body, and presenting the same form, in the *Arenicolea*; and I may say the same of the branchiæ of the *Nephthydea* and *Nerinea* as compared with those of the *Ariciea* and *Hermellea*.

But it is especially in the details of certain families, and when the genera become numerous, that we see numerous *corresponding terms* make their appearance. We may judge of this by a mere glance at the table of *Syllidea*. Here the number of well-characterized genera rises to thirty-one, and from group to group we see repeated the absence or the presence of frontal lobes, the same number of antennæ, tentacles, eyes, &c. These groups and genera are, in every acceptation of the word, the *analogues*, or the *corresponding terms* of each other.

The frequency of this kind of relations results from a remarkable fact, presented by no class of the animal kingdom in so marked a manner as by the *Annelides*. In them the immense variety of secondary characters is obtained in the most simple manner, by modifications of the same nature, or even very often completely identical, repeating themselves in groups which are otherwise distinguished by well-marked differences, in such a manner that a very considerable number of results is usually obtained with a truly marvellous economy of processes. The *Syllidea*, the *Terebellea*, and the *Serpulea* offer us remarkable examples of this fact. In the *Terebellea* in particular, the three known heteromorphous genera are the exact repetition of three normal genera, and are distinguished only because they have in common the kind of modifications which I have indicated above.

* These resemblances are, however, more apparent than real; for the branchiæ of the *Chloræmea* issue from the buccal ring, and not from the head properly so called.

Nowhere, I think, can we point out so complete a manifestation of the *law of economy* upon which M. Milne-Edwards has very justly insisted in his 'Essai de Zoologie générale.'

Reciprocal terms also often make their appearance in the families, and from tribe to tribe; but it will be understood that examples of them are rare, precisely because, the families being very natural, there are but few that I have been obliged to subdivide. Indeed, properly speaking, I only know of one truly worthy of attention, namely that presented by the family *Serpulea*. Here the small group of *Sabellea* with a calcareous tube, compared with the other representatives of the *Sabella*-type, presents a remarkable exception, which assimilates it to the true *Serpulea*, all of which have tubes of this nature. Hence many authors have arranged the *Protulæ* by the side of the latter and far from the *Sabellæ*, with which they have such evident relations in their organization. On the other hand, the genus *Filigrana*, although composed of species which inhabit a calcareous tube, does not possess true opercula, and is related in other respects to the *Sabellea*. Although not so evident as in the cases previously cited, the reciprocity cannot be overlooked here.

It may be remarked that, as regards the form and arrangement of the branchiæ, the *Protulæ* and the *Psygmobranchi* (*Sabellea* with calcareous tubes) precisely repeat the two arrangements presented by the *Serpulæ*, the *Vermiliæ*, and the *Cymospiræ* (true *Serpulea*), so that they play the double part of reciprocal and corresponding terms.

In glancing over the various tables of the families, the reader will easily remark that the characters placed in the first rank are far from being always derived from the same organs. Most frequently the feet, or the totality of the body, have served me as a starting-point; but sometimes the cephalic appendages, sometimes the number and arrangement of the branchiæ, &c., the proboscis, or even the eyes have furnished me with the most general characters. This is because, in fact, in the class of Annelides as in the animal kingdom in general, the same apparatus does not retain throughout an identical and constant value as a means of characterization. It is evident, for example, that when in the whole of a family, as in the *Eunicea*, the feet are uniformly uniramose, furnished with two cirri, and armed with setæ modelled on the same type, we cannot find in them the characters of groups or genera; at the utmost they will serve for the distinction of the species. On the contrary, in the *Syllidea*, in which the same organs become progressively degraded until they only present a small setigerous mamilla, the naturalist finds excellent characters in their successive modifications affecting one of the most essential parts of the body.

I will terminate these generalities by a last observation. The simple statement of the preceding facts would suffice to enable us to conclude with certainty that the relations existing between the different groups of the class of Annelides are extremely multifarious. Even if we confine ourselves to the families, it must be evident that any linear classification is absolutely incapable of giving a real idea of these relations; and a glance at the following Table places this conclusion beyond a doubt. We cannot arrange these twenty-six families either in a single or in several series without the interruption of zoological relations more or less intimate. The arrangement on a single plane attempted by Grube is equally incapable of giving even an approximate idea of these relations. To arrive at this, it would be indispensable to have recourse to the multiple superposed planes so justly proposed by M. Chevreul.

The consequence to be drawn from this fact is, that there always enters a certain arbitrary element into the relative position of the groups which the necessities of *nomenclature* compel us to arrange in a series. I can therefore easily understand that some of my *confrères* may find fault with the order that I have adopted; nevertheless I think I may say that an arrangement which enables us to ascertain, even by a very rapid examination, the principal general facts above indicated, must at least present some advantages.

Class ANNELIDA.

(2 Orders, 4 Suborders, 26 Families.)

Order I. Erraticæ.

Regions of the body similar.

I. Segments dissimilar ..... Suborder I. E. aberrantes.
A. With elytra ..... 1. *Aphroditea.*
B. Without elytra ..... 2. *Palmyrea.*
II. Segments similar or subsimilar..... Suborder II. E. propriæ.
A. No rotatory apparatus.
a. Buccal armature complex.
* With branchiæ ..... 3. *Eunicea.*
† Without branchiæ ..... 4. *Lumbrinerea.*
b. Buccal armature simple or none.
* Head of ordinary form.
α. With true branchiæ.
a. Branchiæ somatic.
** Branchiæ arborescent..... 5. *Amphinomea.*
†† Branchiæ cirriform, short.
αα. No true tentacles ..... 6. *Nephthydea.*
ββ. With true tentacles ..... 7. *Nerinea.*
§§ Branchiæ cirriform, elongated ..... 8. *Cirratulea.*
b. Branchiæ cephalic ..... 9. *Chloræmea.*
β. No true branchiæ.
a. One pair of jaws and some denticles... 10. *Nereïdea.*

b. Jaws scarcely ever present, sometimes denticles, never both together.
** Cirri simple.
1. Trunk not exsertile ..... 11. *Syllidea.*
2. Trunk exsertile ..... 12. *Hesionea.*
†† Cirri lamellar ..... 13. *Phyllodocea.*
† Head conical and composed of distinct segments ..... 14. *Glycerea.*
B. A rotatory apparatus ..... 15. *Polyophthalmea.*

Order II. Sedentariæ.

Regions of the body dissimilar.

I. Segments of one or more regions very dissimilar to each other ..... Suborder III. S. aberrantes. 16. *Chætopterea.*
II. Segments of the different regions always similar or subsimilar to each other ..... Suborder IV. S. propriæ.
A. No branchiæ.
a. No setæ on the feet ..... 17. *Tomopteridea.*
b. With setæ on all or nearly all the feet ..... 18. *Clymenea.*
B. With branchiæ.
a. Branchiæ somatic.
* Branchiæ abdominal or abdominal and thoracic.
α. Branchiæ arborescent ..... 19. *Arenicolea.*
β. Branchiæ cirriform or laciniate.
a. With no prehensile cirri or tentacles.
** Rami not very distinct ..... 20. *Opheliea.*
†† Rami very distinctly marked ..... 21. *Ariciea.*
b. Without prehensile cirri, but with tentacles ..... 22. *Leucodorea.*
c. With prehensile cirri ..... 23. *Hermellea.*
† Branchiæ exclusively thoracic.
α. Operculum formed of setæ ..... 24. *Pectinarea.*
β. No operculum ..... 25. *Terebellea.*
b. Branchiæ cephalic ..... 26. *Serpulea.*

Family 1. Aphroditea. (15 genera.)

I. Elytra only dorsal.
A. Elytra confined to a portion of the feet.
a. No dorsal cirri ..... 1. *Pholoë.*
b. With dorsal cirri.
* Dorsal cirri alternating with the elytra.
α. Jaws none or rudimentary.
a. With hairs on the feet ..... 2. *Aphrodite.*
b. No hairs on the feet.
** 3 antennæ ..... 3. *Hermione.*
†† 2 antennæ ..... 4. *Milnesia.*
β. Jaws corneous.
a. 4 antennæ ..... 5. *Polyodontes.*
b. 3 antennæ
** With pseudobranchial tubercles .. 6. *Acoëtes.*
†† With no pseudobranchial tubercles.
1. Elytra all along the body ..... 7. *Polynoë.*

2. Elytra leaving the posterior part of the body naked..... 8. *Lepidonotus.*
c. 2 antennæ..... 9. *Iphione.*
† Dorsal cirri on all the feet.
α. Elytra covering the whole body.
a. 3 antennæ ..... 10. *Sthenelaïs.*
b. 2 antennæ ..... 11. *Sigalion.*
c. 1 antenna..... 12. *Psammolyce.*
β. Elytra leaving the posterior part naked.. 13. *Hemilepidia.*
B. Dorsal cirri on all the feet ..... 14. *Pelogenia.*
II. Elytra dorsal and abdominal ..... 15. *Gastrolepidia.*

Genera incertæ sedis 2: *Hermenia, Eumolphe.*

Family II. Palmyrea (4 genera).

I. Segments not numerous.
A. Feet biramose.
a. 1 antenna ..... 1. *Palmyra.*
b. 2 antennæ..... 2. *Chrysopetalon.*
B. Feet uniramose ..... 3. *Paleanotus.*
II. Segments numerous ..... 4. *Bhawania.*

Family III. Eunicea (4 genera).

I. Antennæ 5.
A. With tentacles ..... 1. *Eunice.*
B. Without tentacles ..... 2. *Marphysa.*
II. Antennæ 7.
A. With tentacles ..... 3. *Diopatra.*
B. Without tentacles ..... 4. *Onuphis.*

Family IV. Lumbrinerea (8 genera).

I. Antennæ wanting.
A. No dorsal cirrus ..... 1. *Lombrinereïs**.
B. With a dorsal cirrus ..... 2. *Notocirrus.*
II. Antenna single.
A. No dorsal cirrus ..... 3. *Blainvillea.*
B. With a dorsal cirrus ..... 4. *Nematonereïs.*
III. Antennæ 2..... 5. *Œnone.*
IV. Antennæ 3.
A. Head free..... 6. *Lysidice.*
B. Head concealed ..... 7. *Aglaura.*
V. Antennæ 5 ..... 8. *Plioceras.*

Genus incertæ sedis: *Zygolobus.*

Family V. Amphinomea (7 genera).

I. Feet biramose.
A. With antennæ and tentacles.
a. Branchiæ pinnatifid..... 1. *Chloë.*
b. Branchiæ arborescent ..... 2. *Amphinome.*
c. Branchiæ cirriform ..... 3. *Linophera.*
B. With an antenna..... 4. *Euphrosyne.*

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* *Lumbriconereïs*, Blainville.

II. Feet uniramose.
A. With antennæ and tentacles..... 5. *Hipponoë.*
B. Antennæ and tentacles wanting.
a. Branchiæ in rows..... 6. *Lophonota.*
b. Branchiæ in groups..... 7. *Didymobranchus.*

GENERA INCERTÆ SEDIS 2: *Aristenia, Cryptonotus.*

Family VI. Nephthydea (3 genera).

I. Head bearing antennæ.
A. Antennæ 4 ..... 1. *Nephthys.*
B. Antennæ 2 ..... 2. *Portelia.*
II. Antennæ wanting ..... 3. *Diplobranchus.*

Family VII. Nerinea (6 genera).

I. Feet biramose.
A. Feet without cirri.
a. No uncini ..... 1. *Nerine.*
b. Uncini present..... 2. *Uncinia.*
B. Feet bearing cirri.
a. Inferior cirri only..... 3. *Aonis.*
b. Inferior and superior cirri.
* No eyes ..... 4. *Malacocera.*
† Eyes present ..... 5. *Colobranchus.*
II. Feet uniramose ..... 6. *Pygospio.*

GENERA INCERTÆ SEDIS 2: *Pygophyllum, Clytia.*

Family VIII. Cirratulea (6 genera).

I. Branchiæ on nearly all the segments.
A. Branchiæ both pedal and dorsal.
a. The two sorts of branchiæ appearing at the same time ..... 1. *Cirratulus.*
b. Pedal branchiæ preceding the dorsal ..... 2. *Audouinia.*
B. Branchiæ pedal only ..... 3. *Cirrinereis.*
II. Branchiæ only on the first segments.
A. No tentacles..... 4. *Dodecaceræa.*
B. One pair of tentacles ..... 5. *Heterocirrus.*
C. Three pairs of tentacles ..... 6. *Nagaranseta.*

Family IX. Chloræmea (2 tribes, 5 genera).

I. Body covered with hairs (Tribe *Chloræmea prop.*) 1. *Chloræma.*
II. Body without hairs, or with very short hairs. (Tribe *Chloræmea nuda*).
A. Head protected by setæ.
a. All the feet biramose.
* Head very distinct ..... 2. *Siphostomum.*
† Head indistinct..... 3. *Pherusa.*
b. Only the first feet biramose ..... 4. *Lophiocephala.*
B. Head entirely uncovered ..... 5. *Brada.*

GENERA INCERTÆ SEDIS 4: *Spinther, Flemingia, Stylaroides, Tecturella.*

Family X. Nereïdea (2 tribes, 4 genera).

I. Body forming one region (Tribe *Nereïdea prop.*).
  A. Feet uniramose ..... 1. *Lycastis.*
  B. Feet biramose ..... 2. *Nereis.*
II. Body forming two regions (Tribe *Heteronereïdea*).
  A. All the setæ like those of *Nereïs* ..... 3. *Nereïlepas.*
  B. Part or the whole of the setæ reniform ..... 4. *Heteronereïs.*

Genera incertæ sedis 2: *Micronereïs, Zothea.*

Family XI. Syllidea (31 genera).

I. Feet moveable.
  A. With dorsal and abdominal cirri.
    a. No tubercles on the body.
      * Gizzard armed.
        α. 4 antennæ.
          a. 12 tentacles ..... 1. *Syllidia.*
          b. No tentacles ..... 2. *Prionognathus.*
        β. 3 antennæ ..... 3. *Gnathosyllis.*
      † Gizzard unarmed.
        α. Head and buccal segment distinct.
          a. With frontal lobes.
            ** Antennæ 5 ..... 4. *Pterosyllis.*
            †† Antennæ 4 ..... 5. *Brania.*
            §§ Antennæ 3.
              1. Tentacles 8 ..... 6. *Procoma.*
              2. Tentacles 4.
                Eyes 4 ..... 7. *Syllis.*
                Eyes 6 ..... 8. *Ehlersia.*
              3. Tentacles 0 ..... 9. *Exogone.*
            †‡ Antennæ 2 ..... 10. *Grubea.*
          b. No frontal lobes.
            ** Antennæ 4.
              1. Tentacles 16 ..... 11. *Kefersteinia.*
              2. Tentacles 0 ..... 12. *Eucerastes.*
            †† Antennæ 3.
              1. Tentacles 4.
                Eyes 4 ..... 13. *Autolytus.*
                Eyes 0 ..... 14. *Trichosyllis.*
              2. Tentacles 2 ..... 15. *Heterosyllis.*
              3. Tentacles 0 ..... 16. *Gossia.*
        β. Head and buccal segment confounded.
          a. With frontal lobes.
            ** 3 antennæ and 4 tentacles determinable ..... 17. *Claparedia.*
            †† Antennæ and tentacles indeterminable { 8 ..... 18. *Cystonereïs.* / 5 ..... 19. *Sphærosyllis.* / 4 ..... 20. *Oophylax.* / 3 ..... 21. *Isosyllis.*
          b. No frontal lobes; antennæ and tentacles indeterminable { 7 ..... 22. *Thylaciphora.* / 5 ..... 23. *Ambliosyllis.* / 0 ..... 24. *Tetraglena.*
    b. With tubercles on the body ..... 25. *Eurysyllis.*
  B. No abdominal cirri.
    a. With frontal lobes ..... 6. *Sylline.*

b. No frontal lobes.
* Antennæ 3.
α. Tentacles 4 ..... 27. *Myrianida.*
β. Tentacles 2 ..... 28. *Ioida.*
† Antennæ 2 ..... 29. *Mycrosyllis.*
C. Neither dorsal nor abdominal cirri ..... 30. *Schmardia.*
II. Feet immoveable ..... 31. *Dujardinia.*

Genera incertæ sedis 17 : *Polybostricus, Sacconereïs, Polynice, Diplocerœa, Photocharis, Macrochœta, Syllia, Crithida, Anisoceras, Staurocephalus, Sigambra, Diplotis, Ephesia, Sphærodorum, Pollicita, Apœrosyllis, Cirroceros.*

Family XII. **Hesionea** (10 genera).

I. Feet uniramose.
A. Size comparatively large.
a. Segments very numerous ..... 1. *Myriana.*
b. Segments few.
* Antennæ 4 ..... 2. *Hesione.*
† Antennæ 2 ..... 3. *Fallacia.*
B. Size small.
a. Antennæ 4.
* Tentacles 14 ..... 4. *Peribœa.*
† Tentacles 8 ..... 5. *Psamathe.*
§ Tentacles 6 ..... 6. *Lopadorhynchus.*
b. Antennæ 5.
* Tentacles 12 ..... 7. *Podarcus.*
† Tentacles 10 ..... 8. *Mania.*
II. Feet biramose.
A. Antennæ 8 ..... 9. *Pseudosyllis.*
B. Antennæ 4 ..... 10. *Castalia.*

Genera incertæ sedis 5 : *Pisione, Oxydromus, Halimede, Cirrosyllis, Orsèis.*

Family XIII. **Phyllodocea** (2 tribes, 12 genera).

I. Eyes of ordinary size (Tribe *Phyllodocea prop.*).
A. Feet uniramose.
a. Antennæ 5.
* Tentacles 10 ..... 1. *Kinbergia.*
† Tentacles 8 ..... 2. *Eulalia.*
§ Tentacles 6 ..... 3. *Eracia.*
b. Antennæ 4.
* Tentacles 8 ..... 4. *Phyllodoce.*
† Tentacles 6 ..... 5. *Carobia.*
§ Tentacles 4 ..... 6. *Eteone.*
‡ Tentacles 2 ..... 7. *Lugia.*
c. Antennæ 2 ..... 8. *Macrophyllum.*
B. Feet biramose ..... 9. *Notophyllum.*
II. Eyes very large (Tribe *Phyllodocea Alciopea*).
A. Feet bearing two glandular organs ..... 10. *Alciope.*
B. Feet with a single glandular organ.
a. Antennæ 5 ..... 11. *Krohnia.*
b. Antennæ 0 ..... 12. *Torrea.*

Genera incertæ sedis 2 : *Eumenia, Liocope.*

Family XIV. Glycerea (3 genera).

I. Feet biramose.
  A. Rami approximate ..... 1. *Glycera.*
  B. Rami distant ..... 2. *Goniada.*
II. Feet uniramose ..... 3. *Hemipoda.*

Genera incertæ sedis 2: *Glycinide, Proboscidia.*

Family XV. Polyophthalmea (1 genus, *Polyophthalmus*).

Family XVI. Chætopterea (1 genus, *Chætopterus*).

Genus incertæ sedis: *Spiochætopterus.*

Family XVII. Tomopteridea (1 genus, *Tomopteris*).

Family XVIII. Clymenea (2 tribes, 10 genera).

I. Body in three regions (Tribe *Clymenea prop.*).
  A. With an anal funnel.
    a. No respiratory cæca.
      * Cephalic plate developed ..... 1. *Clymene.*
      † Cephalic plate wanting or rudimentary .... 2. *Leiocephalus.*
    b. Respiratory cæca present ..... 3. *Johnstonia.*
  B. With an anal plate.
    a. With a cephalic plate ..... 4. *Maldane.*
    b. No cephalic plate ..... 5. *Petaloproctus.*
  C. Neither plate nor funnel ..... 6. *Ammochares.*
II. Body in two regions (Tribe *Clymenea degrad.*).
  A. Head truncate ..... 7. *Clymenidia.*
  B. Head not truncate.
    a. Head acute.
      * Posterior region with simple setæ ..... 8. *Arenia.*
      † Posterior region with only uncini ..... 9. *Ancistria.*
    b. Head clavate ..... 10. *Clymenia.*

Genera incertæ sedis 3: *Capitella, Notomastus, Dasybranchus.*

Family XIX. Arenicolea (2 genera).

I. Branchiferous feet consecutive ..... 1. *Arenicola.*
II. Branchiferous feet separated by abranchiate ones 2. *Chorizobranchus.*

Genera incertæ sedis 2: *Scalibregma, Polyphysia.*

Family XX. Opheliea (3 genera).

I. Feet with a single branchia.
  A. On the middle region ..... 1. *Ophelia.*
  B. Nearly on the whole body ..... 2. *Travisia.*
II. Feet with several branchiæ ..... 3. *Branchoscolex.*

Genera incertæ sedis 3: *Ophelina, Ammotripane, Sclerocheilus.*

Family XXI. Ariciea (5 genera).

I. Trunk of ordinary form.
  A. Lower ramus of anterior feet bearing uncini.
    a. No antennæ ..... 1. *Arieia.*
    b. With antennæ ..... 2. *Orbinia.*

B. Lower ramus of anterior feet with simple setæ.
  a. No caruncle ..... 3. *Scoloplos.*
  b. Caruncle present ..... 4. *Porcia.*
II. Trunk divided into foliaceous lobes..... 5. *Anthostomum.*

GENERA INCERTÆ SEDIS 4: *Magelona, Gisela, Theodisca, Hermandura.*

Family XXII. Leucodorea (5 genera).

I. Feet different.
  A. Feet biramose.
    a. Branchiæ superior ..... 1. *Leucodore.*
    b. Branchiæ inferior.
      * Third segment abnormal ..... 2. *Disoma.*
      † Fifth segment abnormal ..... 3. *Polydora.*
  B. Feet uniramose ..... 4. *Spione.*
II. Feet similar ..... 5. *Spiophanes.*

GENUS INCERTÆ SEDIS: *Spio.*

Family XXIII. Hermellea (3 genera).

I. Body in 3 regions.
  A. Operculum with 3 ranges of setæ..... 1. *Hermella.*
  B. Operculum with 2 ranges of setæ..... 2. *Pallasia.*
II. Body in 2 regions ..... 3. *Centrocorone.*

GENERA INCERTÆ SEDIS 2: *Branchiosabella, Uncinochæta.*

Family XXIV. Pectinarea (2 genera).

I. Branchiæ 2 pairs ..... 1. *Pectinaria.*
II. Branchiæ 3 pairs..... 2. *Scalis.*

Family XXV. Terebellea (3 tribes, 11 genera).

I. Body in 2 regions (*Terebellea prop.*).
  A. With dorsal branchiæ (Tribe *T. branchiata*).
    a. Dorsal branchiæ arborescent { 3 pairs .... 1. *Terebella.* / 2 pairs .... 2. *Physelia.* / 1 pair .... 3. *Idalia.*
    b. Dorsal branchiæ pectinated, median..... 4. *Terebellides.*
    c. Dorsal branchiæ cirriform.
      * Buccal cirri simple ..... 5. *Phenacia.*
      † Buccal cirri pinnate ..... 6. *Sabellidis.*
    d. Dorsal branchiæ cirriform and pinnate..... 7. *Isolda.*
  B. No dorsal branchiæ (Tribe *T. abranchiata*).... 8. *Apneumea.*
II. Body in one region (Tribe *Heteroterebellea*).
  A. Dorsal branchiæ arborescent { 3 pairs ..... 9. *Heteroterebella.* / 2 pairs ..... 10. *Heterophysella.*
  B. Branchiæ cirriform..... 11. *Heterophenacia.*

GENERA INCERTÆ SEDIS 7: *Rhytocephalus, Amphictëis, Polycirrus, Sabellina, Anisomelus, Piratesa, Lumara.*

Family XXVI. Serpulea (3 tribes, 21 genera).

I. Head without an operculum.
  A. Regions distinct (Tribe *S. Sabellea*).
    a. Tube membranous.
      * Branchiæ with a circular base.
        a. Cirri free.
          a. No caudal eyes..... 1. *Sabella.*

b. Caudal eyes.
1. Antennæ present.
With a collar ..... 2. *Oria.*
With no collar ..... 3. *Amphiglena.*
2. No antennæ ..... 4. *Fabricia.*
β. Branchial cirri united ..... 5. *Chonca.*
† Branchiæ with a spiral base.
α. A single branchia in spiral ..... 6. *Spirographa.*
β. Both branchiæ in spiral ..... 7. *Distylia.*
b. Tube calcareous.
* Branchiæ with a spiral base ..... 8. *Protula.*
† Branchiæ with a circular base ..... 9. *Psygmobranchus.*
B. Regions indistinct (Tribe *S. Heterosabellea*).
a. With feet.
* Branchial cirri free.
α. With barbules ..... 10. *Anamæbæa.*
β. No barbules ..... 11. *Amphicorine.*
† Branchial cirri united ..... 12. *Myxicola.*
b. Without feet.
* Branchiæ with barbules ..... 13. *Gymnosoma.*
† Branchiæ without barbules ..... 14. *Phoronis.*
II. Head with an operculum (Tribe *Serpulea prop.*).
A. Two or more false opercula ..... 15. *Filigrana.*
B. With true opercula.
a. Tube completely rolled up ..... 16. *Spirorbis.*
b. Tube more or less sinuous.
* Two symmetrical opercula ..... 17. *Codonytes.*
† One operculum.
α. Tube free ..... 18. *Ditrupa.*
β. Tube attached.
a. Branchiæ with a circular base.
1. Operculum corneous ..... 19. *Serpula.*
2. Operculum corneo-calcareous ..... 20. *Vermilia.*
b. Branchiæ with a spiral base ..... 21. *Cymospira.*

Genera incertæ sedis 5: *Spiramella, Apomatus, Spiroglypha, Stoa, Vermiculum.*

Class GEPHYREA.

(2 Orders, 7 Families.)

I. Body bearing setæ ..... Order I. G. armata.
A. Several anterior bundles ..... 1. *Sternaspidea.*
B. Two simple anterior setæ.
a. With posterior setæ ..... 2. *Echiurea.*
b. No posterior setæ ..... 3. *Bonellea.*
II. Body not bearing setæ ..... Order II. G. inermia.
A. Anus terminal.
a. With external posterior branchiæ ..... 4. *Priapulea.*
b. No external posterior branchiæ ..... 5. *Lovosiphonea.*
B. Anus dorsal.
a. Scutes present ..... 6. *Aspidosiphonea.*
b. No scutes ..... 7. *Sipunculea.*

Family I. **Sternaspidea** (genus *Sternaspis*).

Family II. **Echiurea** (genus *Echiurus*).

Family III. Bonellea (2 genera).

I. Cephalic appendage simple ..... 1. *Thalassema.*
II. Cephalic appendage bifurcate ..... 2. *Bonellia.*

Genera incertæ sedis 3: *Ochetostoma, Lesinia, Halicryptus.*

Family IV. Priapulea (3 genera).

I. Branchiæ supported on a stem .... { 1..... 1. *Priapulus.* / 2..... 2. *Chætoderma.*
II. Branchiæ borne on a prolongation of the body .. 3. *Trypanius.*

Family V. Loxosiphonea (2 genera).

I. Body bearing 1 scute ..... 1. *Loxosiphon.*
II. Body bearing 2 scutes ..... 2. *Diesingia.*

Family VI. Aspidosiphonea (genus *Aspidosiphon*).

Family VII. Sipunculea (2 genera).

I. Buccal cirri simple ..... 1. *Sipunculus.*
II. Buccal cirri pinnate or ramified ..... 2. *Dendrostomum.*

Generæ incertæ sedis 2: *Ascosoma, Anoplosomatum.*

[To be continued.]

II.—*Carcinological Gleanings.*—No. II.

By C. Spence Bate.

[Plate II.]

Brachyura.

Achæus Cranchii.

This species is spoken of by Bell as being rare, two specimens only having been recorded—one from Falmouth, the second from the south coast of Ireland. Certainly this little Crab is by no means uncommon off the coast of South Devon, in depths of from 6 to 20 fathoms of water, as we have taken it with the dredge in Plymouth Sound, and frequently had it brought in by the trawlers.

Among the specimens that we dredged, two were taken from about 6 fathoms of water, near the Knap buoy, off the western end of the Plymouth Breakwater, which appear to belong to a very distinct variety. Our attention was first drawn to it from observing a peculiarity in its habit, differing from that of the known species, which is that it covers itself with weed, as we know is commonly done by animals of the allied genus *Pisa*.

Certainly in *Pisa* this is no accidental circumstance, since all the spines are sharp-pointed and curved, thus forming strong hooks, on which hang the various kinds of weed.